Algebra 2 - Absolute Value

Stasya

"To me, mathematics, computer science, and the arts are insanely related. They're all creative expressions." – Sebastian Thrun

Note: It is expected that you try the examples to the best of your understanding, and complete the problem sets by the test date and ask for help where needed.

1 Absolute Value Functions

Remember to note that absolute value is the distance a value if from zero and that absolute value can never be negative.

For all real numbers x and positive real numbers a, $|x| = a$ is equivalent to $x = a$ or $x = -a$.

In order to solve an absolute value expression follow these steps:
1. Isolate the absolute value on one side of the equation.
2. Separate the absolute value into two equations (one positive and one negative).
3. Drop the absolute value bars and solve for the variable.
4. Check that the solutions are not extraneous.

Example: Solve $|3x + 9| - 10 = -4$ for x.

Solution: $x = -1$ and $x = -5$.

In order to write an absolute value equation follow these steps:
1. Draw a number line with the given values.
2. Identify the halfway point and the distance to the halfway point.
3. Plug values into the formula, $|x-$halfway point$|$ = distance from halfway point.
4. Verify that the equation works.

Example: Write an absolute value equation that has the solutions $x = 2$ and $x = 9$.

Solution: $|x - 5.5| = 3.5$.

2 Absolute Value Inequalities

In order to solve an absolute value inequality follow the steps:
1. Isolate the absolute value.
2. Decide if the equation has a greater than or a less than.
3. Separate into 2 inequalities.
4. Solve each one for x.
5. Write the formal solution.

Example: Solve for x in $|3 + 2x| - 4 \geq 9$.

Solution: $x \leq -8$ or $x \geq 5$.

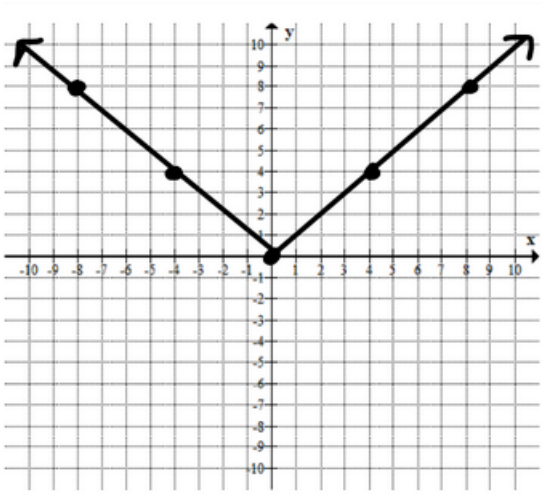
To write an absolute value inequality, follow the format $|x-$midpoint$|$ is greater than or less than the distance from the midpoint.

Example: A machine at a lumber mill cuts boards that are 3.25 meters long. It is acceptable for the length to differ from this value by at most 0.02 meters. Write and solve an absolute value inequality to find the range of acceptable lengths.

Solution: $|x - 3.25| \leq 0.02$.
$3.23 \leq x \leq 3.27$.

3 Graphing Absolute Value

The following is the parent function $f(x) = |x|$.



The ideas from Unit 2 about transformations apply to any parent function, and can be applied to the absolute value function as well.

Example: Write the transformations of the function $f(x) = |x + 5| - 2$.

Solution: A shift left 5 units and a shift down 2 units.